REMARKS

Claims 1, 4, and 6-10 remain in the application for further prosecution. These preliminary amendments presume that the previously unentered amendment after final has now been entered. Claim 1 has been amended to distinguish the Buechler reference by including a reagent-carrying substrate disposed adjacent to the array of microstructure posts and by defining the disposition of the posts to provide lower capillary forces than in the upstream capillary passageway.

Double Patenting

Claims 1-4 and 6 have been provisionally rejected on the ground of non-statutory double patenting over claims 1, 4-6 and 8 of copending application 10/608,400. Since the claims have been amended herein, filing of a terminal disclaimer may not be needed and filing will be deferred until such time as the applications have been found allowable.

Rejections Under 35 U.S.C. § 102

Claims 1 and 8 were rejected in the Office Action of November 2, 2006 under 35 U.S.C. § 102(b) as anticipated by Buechler (U.S. 6,113, 855).

Buechler's patent is principally directed to improving the flow from one region of his assay device to another larger region, despite the need for additional space to accommodate the liquid volume. He solved his problem by adding structures to increase capillary forces in the larger region. However, Buechler provided only cursory information about the disposition of reagents in his device. Buechler was not concerned with the uniform distribution of liquids over reagents, which is the problem addressed by the Applicants. The Applicant's device requires the

presence of a groove or a weir to facilitate distribution across the inlet chamber. Therefore, Claim 1 no longer could be considered anticipated by Buechler, since he lacks these features, as the Examiner has admitted. Furthermore, the present amendment adds a reagent-containing substrate positioned adjacent to the microstructure posts, a feature not found in Buechler, and includes arraying the posts to provide lower capillary force relative to the capillary force in the entry capillary passageway.

In general, Buechler teaches that posts should provide greater capillary forces in his "distal" region, which was made larger to accommodate the liquid sample and any other liquids that may be used (see column 6, lines 44-47). Clearly, Buechler increased capillary force in the distal region to draw liquid out of the proximal region into the distal region where reactions occur. The Applicants microfluidic device relies on force being applied to overcome capillary stops, for example by applying centrifugal force or applying pressure with a plunger at the inlet port. Liquid moving by capillary force through a capillary passageway will naturally stop at the inlet of a large chamber and must be restarted so that the liquid enters the chamber. In Buechler, the posts were spaced to create an increased capillary force. This was not desired by the Applicants, who wanted to distribute liquid uniformly over a substrate.

Although the Applicants did not specifically state that their microposts were disposed so as to provide lower capillary force in the region where reagent-containing substrates were located, nevertheless, the Applicant's purpose is implied by their teachings. When a liquid moves by capillary forces through a passageway and reaches the entrance to a relatively large chamber, flow stops since the capillary forces become nil. The liquid flow resumes and enters the chamber when additional force is applied. Centrifugal force may be used or additional liquid

forced in (see Example 3). Thus, increased capillary force was not being provided by the microposts sufficient to cause liquid to continue flowing. Using lower capillary force is contrary to the teachings of Buechler, who positioned his microposts to increase capillary force to be equal or greater than was available in his upstream capillary channel. The Applicant's invention emphasizes that liquid is distributed uniformly over the reagent-containing substrate. This was done by including microposts, but not with the increased capillary force used by Buechler. Instead the microposts distribute the liquid over the substrate while pushing all the air out. Trapping pockets of air by rapidly moving liquid means that the substrate is not uniformly covered, which produces non-uniform reactions.

As amended, the Applicant's claims now state that a substrate containing reagents is positioned adjacent to the array of posts, not on them. Buechler says little, but appears to place reagents on his array of posts. At Column 3, lines 56-64, Buechler suggests that reagents can be bound to a "solid phase", which he then says can usefully occur in "capillary spaces", which "should be as small as possible to improve the kinetics of the reaction". This suggests that to take advantage of the increased velocity and turbulence which will be present around the posts, that the reagent will be located on the posts, since it is the sides of the posts that create increased capillary forces. Furthermore, Buechler says that he leaves space above the tops of his posts, which filled with liquid and was outside the array of posts with their increased capillary forces. See column 8, lines 5-7, 29-34, and 55-57 and column 9, lines 14-17, and 38-40. Therefore, it follows that Buechler did not intend to place reagent-continuing substrates adjacent his array of posts, as the Applicants claim.

Buechler apparently was not concerned with the problems associated with applying liquids over substrates containing reagents. It is vital to distribute a sample liquid uniformly over a substrate if one is to obtain the most accurate results. The Applicant's have found, contrary to the Buechler invention, that increasing capillary forces in the reagent-containing chamber leads to bypassing of the reagent-containing substrate and failure to remove all of the air originally in the chamber. While an array of posts may be used, they do not provide increased capillary forces and, in effect, slow down the liquid flow and distribute it over an adjacent substrate, while pushing out the air.

The presence of the reagent-containing substrate alone is not sufficient to assure uniform distribution of the liquid over the substrate. Bypassing of the substrate occurs. When an array of posts is included, the liquid is distributed uniformly over the substrate. In the alternative case, where the array of posts is present, but with no substrate, the posts are bypassed since the capillary forces are greater at the chamber walls than through the array of posts. Thus, it is the combination of an array of posts with an adjacent reagent-containing substrate that is able to distribute liquid uniformly over the substrate, while pushing out the air. This is illustrated in the accompanying declaration by one of the Applicants.

As to Claim 8, it depends from Claim 1 and therefore also would not be anticipated by Buechler. Furthermore, Buechler contains only cursory reference to reagents in his device, or to their disposition, since he was concerned with increasing capillary forces rather than uniformly distributing liquids over reagents. The Applicants disagree with the Examiner's characterization of Claim 8 as being a statement of intended use. It should be clear that the device of Claim 8 is not the same device as that of Claim 1, since it has added structural features.

Rejections Under 35 U.S.C. §103

Claims 2 and 3 were rejected under 35 U.S.C. 103(a) in the Office Action of November 2, 2006, as unpatentable (i.e. obvious) over Buechler in view of Columbus (U.S. 4,233,029). This rejection was obviated by the previous amendment, but it should not be applied to amended Claim 1.

As shown in Columbus '029, liquid is introduced at a central location from which it flows in all directions over the opposed set of grooves. The Applicants' device is entirely different since it enters one side of the inlet chamber and distributes liquids over the reagents in the chamber. Thus, the Columbus device is in no sense adapted for use in the Applicant's device. At most, using Columbus as a secondary reference involves both hindsight and selective use of the Columbus teachings.

Claims 4 and 6 were rejected in the previous Office Action as unpatentable over Buechler and Columbus, in view of Peters (U.S. 6,296,126). If Claim 1 is found patentable over Buechler, then Claims 4 and 6 also should be patentable. Peters does teach the use of posts with grooves, but he positions the grooves so as to act as channels to empty capillaries. As Peters notes at column 3, lines 56 *et seq*., his device is based on the "suction action" of the wedge shaped cut-outs. In the present invention, the wedge shaped cut-outs are optional and are positioned 90 degrees from the direction in which the liquid flows. Thus, their position is not that used by Peters and their use in the present invention could not be obvious in Claim 6. As to Claim 4, the use of wedge-shaped cut-outs does not provide a channel for liquid flow, as in Peters, but assists the uniform distribution of liquid over the groove or weir.

Claim 7 was rejected in the previous Office Action as unpatentable over Buechler in view of Wyzgol, et al. (U.S. 6,776,965). This claim also should be patentable if Claim 1, from which it depends is found patentable.

Claims 9 and 10 were rejected in the previous Office Action as unpatentable over Buechler in view of Columbus (U.S. 4,618,476). As with the other claims depending from Claim 1, Claims 9 and 10 also should be patentable. Furthermore, it is incorrect to refer to chamber 470 of Columbus as an overflow chamber. It is a waste chamber. An overflow chamber as defined by the Applicants is one which receives excess sample liquid, so that the correct sample volume is contacted with the reagents in the inlet chamber.

In view of the amendments and the above remarks the Examiner is urged to allow the amended claims. If further amendments are believed necessary, the Examiner is invited to contact the Applicant's attorney at the telephone number provided below.

Respectfully submitted,

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Date

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